

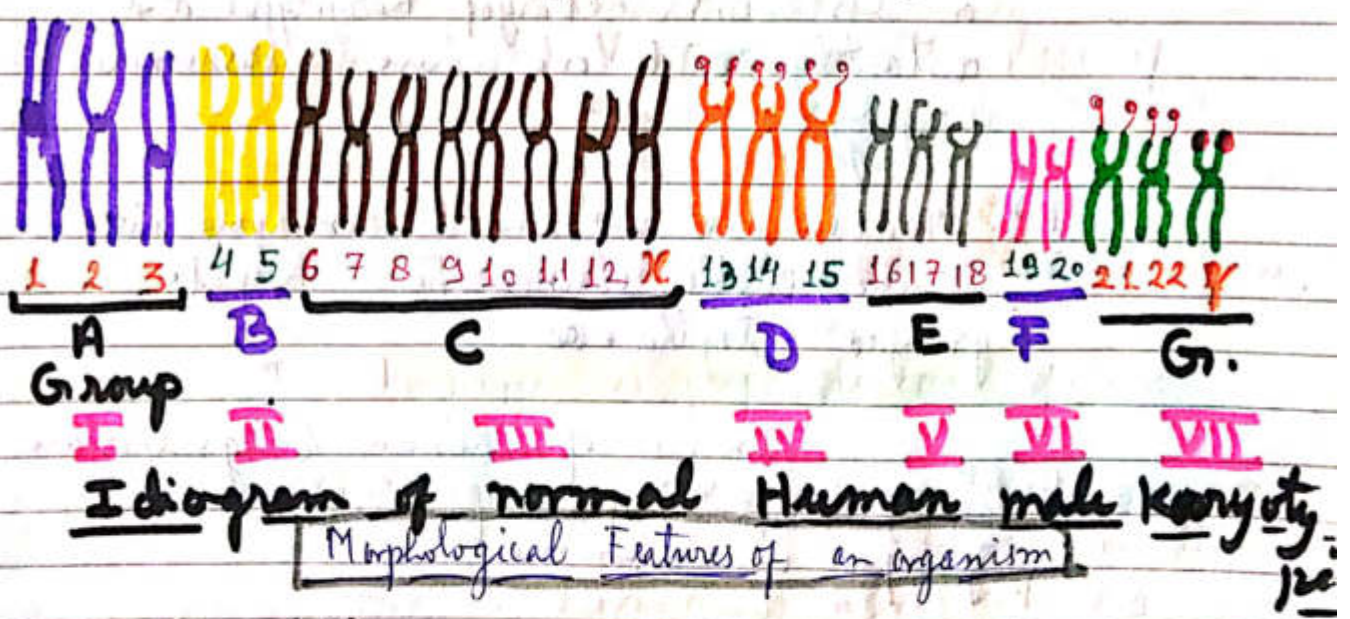
# KARYOTYPE

Karyotype is

The profile of homologous chromosomes in pair of an organism in an arranged order is known as karyotype.

It shows the characteristic of an individual, species, Genus or group.

Karyotype is prepared at <sup>somatic</sup> metaphase of an individuals chromosomes, arranging them in a decreasing series as histogram, showing all of its morphological feature. This depiction is known as Karyogram or Idiogram.



- i) Same Number of chromosomes in a set.
- ii) Relative length of chromosome.
- iii) Ratio of arms (i.e. Long arm & short arm).
- iv) Position of primary & secondary constriction, nuclear organiser and satellite.



v) The differentiation of bands of chromosomes due to Euchromatin and Heterochromatin.

Characteristic of Karyotype:

- 1) It is ~~for~~ similar <sup>for some</sup> for an individual, group, species, genus and other taxonomic forms
- 2) It is used for the showing closeness or fatherness of ~~an~~ among individuals group, ~~of~~ species, genus, families & other groups as  
 closely related ones have more or less similar karyof Karyotypes and distantly related ones have dissimilar karyotypes.
- 3) The identical and ~~and~~ chromosome with indistinguishable chromosomes may be grouped together. as

In case of human beings there are twenty three (23) pairs of chromosomes, grouped in seven one as.

Group I	→	Chromosome No. 1, 2, & 3.
II	→	4 & 5.
III	→	6, 7, 8, 9, 10, 11, 12 & X
IV	→	13, 14, & 15.
V	→	16, 17, 18.
VI	→	19 & 20.
VII	→	21, 22 & Y.



All Russian School (L. I. Sidorov, 1931) the karyotypes are classified into two classes.

i) **Symmetrical**: In such cases the chromosomes are approximately of the same size having ~~metacentric~~ being Metacentric or Sub metacentric types. These are considered as primitive ones.

ii) **Asymmetrical**: In such cases chromosomes pairs are in heterogeneous groups as there is

- a) Degree of variation in the size of chromosomes.
- b) Variation in the type of chromosome due to different position of centromeres.

These are regarded as advanced ones.

The **karyotype** is prepared as follows.

A) Collection of samples → The samples are taken from the actively dividing mitotic cells e.g. (root, stem) root tip cells in plants, white blood cells in human of blood, bone marrow cells, or amniotic fluid etc.

B) Growing of the sample cells :- The sample cells are grown in a right medium or cell culture.



c) Stopping of the growth :- The growth of cells are checked at Metaphase stage.

D) Dyeing of chromosomes :- Normally the chromosomes are colourless. We used certain suitable dyes for staining of the chromosomes. It makes them clearly visible and distinguishable.

E) Sorting of chromosome :- Now the chromosomes are arranged according to their size in decreasing order as Largest to the smallest ones.

F) Analysing → The structure, pattern and count of chromosomes are analysed.

Usefulness of Karyotype analysis

- 1) It may reveal on going genetic (chromosomal) abnormalities.
- 2) Diagnose Genetic disorder of a child e.g. Trisomy 21, i.e. Down syndrome, Turner Syndrome, Mosaicism, Klinefelter Syndrome, Monosomy, Nullisomy etc.



3) Karyotype analysis shows togetherness & fatherness. It determines the parental disputes. It also determines the closeness of species, genus and families etc. so that better taxonomic studies that they are helpful in taxonomic studies also.

### Limitations of Karyotype analysis:

1. Depends upon collection samples.  
- Better in blood samples but poorer in amniotic fluid
2. Invasive diagnostic test may be required.
3. Maternal contamination is common in parental analysis (Amniotic fluid & chorionic villus cells).
4. ~~Not~~